A Type-Table for the PAS

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When I first met John Gittinger (JWG) in 1957 it was not at all obvious that he was about to pose a challenge that would occupy me -- even preoccupy me -- for more than 35 years. But that is exactly what he and the PAS did, and I want to take this opportunity to thank them for it. The PAS has always been fun, has provided a generous share of rewarding moments, and continues to challenge. This paper is a little something in return.

.I've always loved puzzles -- jigsaw puzzles and crossword puzzles, riddles and conundrums, the proofs of geometry and the structures of organic chemistry -- but none of these has been a match for the PAS. The puzzle in the PAS has been not so much that it worked in the first place -- to be convinced, one needed only to listen carefully while JWG discussed the implications of profiles derived from people one knew well, but whom he had never met or even heard of before. The puzzle has been to explain *why* and *how* the PAS works -- to provide a coherent rationale for the interpretive process -- a rationale sufficient to enable someone less gifted than JWG to understand and implement. This puzzle remains unsolved. (Until very recently, its appeal could appropriately be compared with that of Fermat's Last Theorem.) For openers, we must recognize that in 1957 the notion of using the Wechsler as a basis for personality interpretation was alive but not well. The idea was as old as the test itself, having been encouraged by Wechsler (1944, p. 146) and supported by clinical practitioners who had discovered that they could do it, for example, Rapaport (Rapaport, Gill, & Schafer, 1945) or Holt (Holt & Luborsky, 1958). Yet, the prevailing psychometric view of the Wechsler battery was (and still is!) that it measures just three common factors -- perhaps five at the most (Cohen, 1957); Davis (1956) had reported one ten-factor study, but this involved the use of a lot of non-Wechsler variables. Moreover, it was held that the reliability of Wechsler subtest difference scores was so low as to preclude useful clinical interpretation (McNemar, 1957). The practical effect of my first-hand awareness of JWG's interpretive skill was to convince me that the biggest flaws had to be in the psychometrist's reasoning. In due course, four important psychometric flaws have come to light. Most obvious of these, when factor analysis is applied to small matrices, using methods that regard the communalities as initially unknown, there is an artifactural constraint on the number of factors required to provide a good fit to the off-diagonal correlations; for example, a 10-variable matrix can always be fitted *perfectly* with just six factors, and fitted acceptable well with three to five factors. The "anomalous" study implicating the Wechsler in 8 of its 10 factors (Davis, 1956) was also the only study avoiding this constraint. Our first PAS publication (Saunders, 1959) confirmed this reasoning, demonstrating in two different samples that there were at least as many independently measured dimensions in the WAIS as there were subtests.

We now have a stable set of PAS Reference Groups and a rote method of assigning new cases to their proper group. In the simplest terms, these groups may be regarded as the result of a second order cluster analysis of a large sample of Wechsler profiles. Each group corresponds to one mode within a multimodal distribution of subtest profiles. It makes sense to work this way only because the distribution really *is* multimodel. There have been three keys to the success of this enterprise: (1) recognition that multimodality was indeed a *necessary* requirement (Gangestad &Snyder, 1985); (2) recognition that the tendency toward bimodality exhibited by certain Wechsler raw scores is a sufficient (though not necessary) indication that this requirement can actually be met; and (3) use of the PAS framework of primitive, basic, and contact measures to suggest ways of defining optimally bimodal indices. The process of application is as simple as the process of development has been tedious. Given a new case, you score it as usual, evaluate it's position on 8 indices, and search your data base for the most similar previous case according to a d2-statistic. If the minimum d2 is sufficiently small, which it usually is, the new case is added to the first order cluster and to it's reference group, and you are ready to open the Atlas. Overall, in our current data base of 2900 cases, about 90% are assigned to the same reference groups as their nearest neighbor; for d2< 1 this rises above 99%, for d2>4 it falls below 30%. (The distance statistic is standardized so that the centroid of the closest groups are 4 d2 units apart. As the data base grows, so will the percentages just cited.)

From the PAS perspective, we may summarize the possible results in the form of a Type Table, using one cell to represent each group.

In Table 1 page 171, we have arranged and labeled the most important 192 cells according to their most typical PAS pattern. The arrangement proposed in Table 1 has several convenient properties;

1 -- Each cell differs from each of it's immediate neighbors in one respect only.

2 -- The most common patterns are in the center of the table. The edges of the table represent unusual profiles; in many samples they don't occur at all. For example, samples of college students will include almost no one in columns 1 or 2 or 6, or in row 4.

3 -- Each of the 64 Basic Patterns described in the existing PAS Atlas (Gittinger, 1964) is represented by either 2 or 4 contiguous cells. (The distinctions between rows 1 and 2, between rows 3 and 4, between columns 2 and 3, and between columns 5 and 6 are all contact level differences.

4 -- For the time being, no columns are provided either for A-I+S- or for A+I-S+; if these prove to be useful, they may be added as columns 0 and 7, respectively, without disturbing anything else.

It will be noted that the cell definitions of Table 1 ignore the Comprehension subtest, as well as Dsy, CN, TE, Q1 and Q2. This is not to suggest that any of these is unimportant as a measure of individual differences, or as a source of incremental validity for a PAS interpretation; they can all be incorporated into the reference group model by recognizing within-group variability. What is different about these measures is that they do not immediately yield robustly bimodal indices; typically, they are bimodal either for high NL or for low NL but not for both. (Q1 actually contributes more

than OA to better indices.)
The results do contain an interesting irony. The best set of bi -modally distributed indices we have found so far consists of D-X, A-X, I-X, BD-X, S-X, PA-X, PC-X-Q1, wherein X is defined once for the whole profile. The X in these indices looks exactly like it should be called Normal Level. However, the X for a given profile is actually computed as ½ of the highest WTS score in the profile. If we were to define NL as X +k, where k is a universal constant of about 4 or 5, the NL numbers will seem reasonable, at the same time, the contributions of k will cancel out of the calculation of d2 for any two profiles. (If it matters, it is possible to argue that the value of k should be exactly 5. This begins with a basic premise of the PAS, that individuals are prone to behave in ways that exploit their (relative) strengths and cover their (relative) weaknesses. NL may then be seen as providing a useful benchmark against which to assess the strengths and weaknesses of any particular individual. Though notice that we have not specified relative to what. One possibility is "relative to the other people with whom we deal." On the scale of WTS, the highest subtest score is a measure of the first possibility, and 10 is a measure of the second one. If we simply average these two measures, giving them equal weight, the result is X+5 QED.

We are reminded that even before there was a PAS, Rapaport (1945, p.48 ff.) had defined "Vocabulary Scatter" as the deviation of a given subtest in a given profile from V, and justified it's use of the basis that V generally presented the highest mean and lowest sigma of any subtest in his clinical data. There were other early practitioners of scatter analysis who literally used the highest score, regardless of it's identity. The only thing new, it seems, is the "½". The practical effect of the ½ is to rescale each subtest as a dichotomy according to whether it is closer to the top of the profile or closer to the bottom, thus creating the necessary bi-modatilites.

It is safe to say that, without John G, the whole approach would have been abandoned years ago. Thanks again!

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Endnotes

1. These are: (1) the constraint on dimensionality when factor analysis is applied to small matrices; (2) the difficulty of obtaining clear-cut analytic rotational solutions with more than 5 factors; (3) the failure to recognize the implications of using conservative estimates of subtest reliability; and (4) the failure to properly balance the costs of Type I and Type II errors in interpretation.

2. We shall frequently refer to the subtests by their common abbreviations -- Information (I), Comprehension (C), Digit Span (D), Arithmetic (A), Similarities (S), Comprehension (C), Picture Arrangement (PA), Picture Completion (PC), Block Designs (BD), Object Assembly (OA), Digit Symbol (DS) and Vocabulary (V).

3. Analysis of C and S items is especially tricky, if one is to preserve all the possible distinctions between 0,1 and 2-point responses.

4. Thanks are once again due to JWG for his facilitation of this study, by inviting me to visit him in Japan in 1961 and 1963.

5. I am aware of one independent attempt to replicate all these results, which its authors (Beck, Tucker, Parker, Lake, Thomas, et al., 1989) regarded as unsuccessful. This study appears to suffer from several methodological flaws commonly perpetrated in large studies.

6. It is still not possible to say precisely how many groups there are! The frequency distributions of real samples tend to be

extremely disproportionately representive of the possible groups, and there are major realms of possible samples yet to be explored. It can be said that the groups (second-order cluster) are narrower than the PAS basic patterns, but broader than the PAS surface patterns; the first order clusters are definitely narrower than the PAS surface level.

7. In order to relate to these indices to Table 1 it must be assumed that in some sense the unique information in Q1 is equivalent to the OA.

Figure 1: Proposed PAS Type Table

	A-I-S-	A-I-S+	A-I+S+	A+I+S+	A+I+S-	A+I-S-
PC+ OA+	era/ era ira/ ira ir*a/ ir*a er*a/ er*a	ef*a/ ef*a if*a/ if*a ifa/ ifa efa/ efa	i'f*a/ i'f*a e'f*a/ e'f*a e'fa/ e'fa i'fa/ i'fa	i/f*a/ i/f*a e/f*a/ e/f*a e/fa/ e/fa i/fa/ i/fa	i/ra/ i/ra e/ra/ e/ra e/r*a/ e/r*a i/r*a/ i/r*a	e.ra/ e.ra i.ra/ i.ra i.r*a/ i.r*a e.r*a/ e.r*a
PC+ OA-	eru. eru' iru. iru' ir*u. ir*u' er*u. er*u'	ef*u. ef*u' if*u. if*u' ifu. ifu' efu. efu'	i'f*u. i'f*u' e'f*u. e'f*u' e'fu. e'fu' i'fu. i'fu'	i/f*u. i/f*u' e/f*u. e/f*u' e/fu. e/fu' i/fu. i/fu'	i/ru. i/ru' e/ru. e/ru' e/r*u. e/r*u' i/r*u. i/r*u'	e.ru. e.ru' i.ru. i.ru' i.r*u. i.r*u' e.r*u. e.r*u'
PC- OA-	era' era. ira' ira. ir*a' ir*a. er*a' er*a.	ef*a' ef*a. if*a' if*a. ifa' ifa. efa' efa.	i'f*a' i'f*a. e'f*a' e'f*a. e'fa' e'fa. i'fa' i'fa.	i/f*a' i/f*a. e/f*a' e/f*a. e/fa' e/fa. i/fa' i/fa.	i/ra' i/ra. e/ra' e/ra. e/r*a' e/r*a. i/r*a' i/r*a.	e.ra' e.ra. i.ra' i.ra. i.r*a' i.r*a. e.r*a' e.r*a.
PC- OA+	eru eru/ iru iru/ ir*u ir*u/ er*u er*u/	ef*u ef*u/ if*u if*u/ ifu ifu/ efu efu/	i'f*u i'f*u/ e'f*u e'f*u/ e'fu e'fu/ i'fu i'fu/	i/f*u i/f*u/ e/f*u e/f*u/ e/fu e/fu/ i/fu i/fu/	i/ru i/ru/ e/ru e/ru/ e/r*u e/r*u/ i/r*u i/r*u/	e.ru e.ru/ i.ru i.ru/ i.r*u i.r*u/ e.r*u e.r*u/